

AMENDMENTS TO THE CLAIMS

1. (previously presented) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing bath for processing semiconductor wafers, said method comprising:

immersing wafers in a bath of semiconductor processing fluid in a processing apparatus;

processing said wafers immersed in said bath of semiconductor processing fluid contained within said processing apparatus; and

reducing a liquid holding capacity of said processing apparatus, thereby rapidly displacing an upper portion of said bath of semiconductor processing fluid from said processing apparatus while said wafers remain fully immersed in a lower portion of said bath of semiconductor processing fluid within said processing apparatus to remove said surface contaminants from said air/liquid interface.

2-5. (canceled)

6. (previously presented) The method for removing contaminants from a processing bath for processing semiconductor wafers according to claim 1, wherein said contaminants include silica.

7. (currently amended) A method for reducing contamination on a semiconductor wafer from a wet etching bath comprising:

immersing said semiconductor wafer in said wet etching bath contained in a processing apparatus;

processing said semiconductor wafer in said wet etching bath by continuously feeding an etching fluid;

stopping the continuous feeding of said etching fluid;

subsequently rapidly reducing a volume of said wet etching bath contained within said processing apparatus by removing an upper portion of said etching fluid from said processing apparatus to reduce an overall volume of etching fluid in said processing apparatus and remove surface contaminants from an air/liquid interface of said wet etching bath while retaining said semiconductor wafer fully immersed in a lower portion of said etching fluid contained within said processing apparatus; and subsequently removing said semiconductor wafer from said wet etching bath.

8. (canceled)

9. (previously presented) The method for reducing contamination on a semiconductor wafer from a wet etching bath according to claim 7, wherein said upper portion of said etching fluid is removed by draining a top portion of said etching fluid from said wet etching bath.

10. (previously presented) The method according to claim 7, wherein said upper portion of said etching fluid is removed by a paddle from the top of said wet etching bath.

11. (previously presented) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing bath for processing semiconductor wafers, said method comprising:

immersing wafers in said semiconductor processing bath;

reducing a volume of said semiconductor processing bath contained within a processing apparatus by rapidly removing from a top of said processing apparatus an upper surface portion of a semiconductor processing fluid present in said bath to rapidly reduce said volume of said processing bath contained within said processing apparatus, while said wafers are immersed in said bath, by opening a valve in said processing apparatus to remove said surface contaminants from said air/liquid

interface; and

removing said wafers from said semiconductor processing bath.

12. (previously presented) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing cleaning bath for processing semiconductor wafers, said method comprising:

immersing said semiconductor wafers in said semiconductor processing cleaning bath contained in a processing apparatus; and

reducing a volume of fluid in said semiconductor processing cleaning bath before removing said semiconductor wafers by rapidly removing from a top of said processing apparatus an upper portion of a semiconductor processing fluid present in said bath while said wafers are in said bath, by hingedly releasing a door located at an upper portion of said processing apparatus to rapidly reduce a liquid holding capacity of said processing apparatus and to remove said surface contaminants from said air/liquid interface.

13. (original) The method according to claim 9, wherein said upper portion of said etching fluid is removed by sliding a door located at an upper portion of said wet etching bath.

14. (canceled)

15. (previously presented) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing cleaning bath for processing semiconductor wafers, said method comprising:

immersing said wafers in said semiconductor processing cleaning bath contained in a processing apparatus; and

reducing a volume of fluid in said semiconductor processing cleaning bath by rapidly removing an upper portion of a semiconductor processing fluid present in said

bath from said processing apparatus, while said wafers are immersed in said bath, by telescopically collapsing sidewalls of a vessel containing said bath to rapidly reduce a liquid holding capacity of said processing apparatus and to remove said surface contaminants from said air/liquid interface.

16. (canceled)

17. (currently amended) A method for etching a semiconductor wafer, said method comprising:

placing an aqueous hydrofluoric acid etching fluid into a wet etching vessel;
immersing said semiconductor wafer in a process volume of said etching fluid;
contacting said semiconductor wafer with said etching fluid for a predetermined time;

reducing a an overall volume of ~~said etching~~ fluid contained in said wet etching vessel by rapidly removing an upper portion of said etching fluid from the top of said wet etching vessel while keeping said semiconductor wafer immersed to obtain a remaining portion of said etching fluid, said remaining portion having a smaller volume than said process volume; and

removing said semiconductor wafer from said remaining portion of said etching fluid.

18. (original) The method according to claim 17, wherein said semiconductor wafer is a silicon wafer.

19. (canceled)

20. (previously presented) The method according to claim 17, wherein said etching fluid is removed from said wet etching vessel by draining said upper portion of said etching fluid from said wet etching vessel.

21. (previously presented) A method for etching a semiconductor wafer, said method comprising:

placing an etching fluid into a wet etching vessel;
placing said semiconductor wafer in said etching fluid;
contacting said semiconductor wafer with said etching fluid for a predetermined time; and
reducing a liquid holding capacity of said wet etching vessel, thereby rapidly removing a portion of said etching fluid from the top of said wet etching vessel by opening a valve to reduce rapidly an overall volume of fluid in said wet etching vessel while said semiconductor wafer remains immersed in a lower portion of said etching fluid.

22. (previously presented) A method for etching a semiconductor wafer, said method comprising:

placing an etching fluid into a wet etching vessel;
immersing said semiconductor wafer in said etching fluid;
contacting said semiconductor wafer with said etching fluid for a predetermined time; and
rapidly removing a portion of said etching fluid from an upper surface of said wet etching vessel by hingedly releasing a door located at an upper portion of said wet etching vessel to reduce a liquid holding capacity of said wet etching vessel while said semiconductor wafer remains immersed in a lower portion of said etching fluid.

23. (original) A method for etching a semiconductor wafer, said method comprising:

placing an etching fluid into a wet etching vessel;

placing said semiconductor wafer in said etching fluid;

contacting said semiconductor wafer with said etching fluid for a predetermined time; and

rapidly removing a portion of said etching fluid from the upper surface of said wet etching vessel by sliding a door located at an upper portion of said wet etching vessel.

24. (canceled)

25. (previously presented) A method for etching a semiconductor wafer, said method comprising:

placing an aqueous hydrofluoric acid solution into a wet etching vessel;

immersing said semiconductor wafer in said aqueous hydrofluoric acid solution;

contacting said semiconductor wafer with said aqueous hydrofluoric acid solution for a predetermined time; and

reducing a fluid-containing volume of said wet etching vessel so as to rapidly displace a portion of said aqueous hydrofluoric acid solution from an upper portion of said wet etching vessel by telescopically collapsing sidewalls of said wet etching vessel, said semiconductor wafer remaining immersed in a remaining portion of said aqueous hydrofluoric acid solution.

26. (previously presented) The method according to claim 17, wherein said etching fluid is removed from said top of said wet etching vessel by physically

removing said upper portion of said etching fluid from said wet etching vessel.

27. (previously presented) The method according to claim 26, wherein said upper portion of said etching fluid is removed from said wet etching vessel by a paddle.

28-43. (canceled)

44. (previously presented) A method for reducing the contaminants on a silicon wafer during a wet etching process, said method comprising:

immersing a wafer boat suspended on a lifting arm in an etching vessel having an aqueous hydrofluoric acid solution therein for a sufficient time to etch said silicon wafer;

continuously feeding said aqueous hydrofluoric acid solution to process said semiconductor wafer;

stopping said continuous feeding of acid solution; and

rapidly removing said wafer boat from said etching vessel to remove surface contaminants residing on an upper surface of said aqueous hydrofluoric acid solution by an upward movement of said arm, thereby causing an upper portion of said aqueous hydrofluoric acid solution to spill out of said vessel to reduce the amount of said aqueous hydrofluoric acid solution in said etching vessel.

45-51. (canceled)

52. (previously presented) A method for removing surface contaminants from a semiconductor processing bath for processing silicon wafers, said method comprising removing an upper portion of a semiconductor processing fluid present in

said bath, while said wafers are in said bath, by sliding a door located at an upper portion of said bath.

53-57. (canceled)

58. (previously presented) A method for etching a semiconductor wafer, said method comprising:

placing an aqueous hydrofluoric acid solution into a wet etching vessel;
placing said semiconductor wafer in said aqueous hydrofluoric acid solution;
contacting said semiconductor wafer with said aqueous hydrofluoric acid solution for a predetermined time; and

removing a portion of said aqueous hydrofluoric acid solution from the upper surface of said wet etching vessel by sliding a door located at an upper portion of said wet etching vessel.

59-60. (canceled)

61. (previously presented) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing bath for processing semiconductor wafers, said method comprising:

immersing said semiconductor wafers in said semiconductor processing bath contained in a processing apparatus;

reducing a volume of said semiconductor processing bath contained within said processing apparatus by rapidly removing an upper portion of said semiconductor processing bath present in said processing apparatus, while said semiconductor wafers are immersed in a remaining lower portion of said semiconductor processing bath, to permit flow of said upper portion of said processing bath out of said processing apparatus and reduce a total volume of liquid contained within said processing

apparatus and thereby break eddy currents holding said surface contaminants at said air/liquid interface.

62. (previously presented) The method for removing surface contaminants according to claim 61, wherein said upper portion of said semiconductor processing bath is removed by a paddle from a top of said bath.

63. (previously presented) The method for removing surface contaminants according to claim 61, wherein said upper portion of said semiconductor processing bath is removed by opening a valve in said processing apparatus.

64. (previously presented) The method for removing surface contaminants according to claim 61, wherein said upper portion of said semiconductor processing bath is removed by hingedly releasing a door located at an upper portion of said processing apparatus.

65. (previously presented) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing bath for processing semiconductor wafers, said method comprising:

rapidly removing an upper portion of a semiconductor processing fluid present in said bath by sliding a door located at an upper portion of said bath, while said wafers are in said bath, to permit flow of said upper portion of said processing fluid and thereby break eddy currents holding said surface contaminants at said air/liquid interface.

66. (currently presented) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing bath for processing semiconductor

wafers, said method comprising:

immersing said semiconductor wafers in a semiconductor etching bath; and
rapidly removing an upper portion of a semiconductor processing fluid present in said etching bath by rapidly removing a wafer boat containing said wafers from said etching bath, to permit flow of said upper portion of said processing fluid out of said semiconductor etching bath and thereby break eddy currents holding said surface contaminants at said air/liquid interface.

67. (previously presented) The method for removing surface contaminants according to claim 61, wherein said upper portion of said semiconductor processing bath is removed by telescopically collapsing sidewalls of said processing apparatus containing said semiconductor processing bath.

68. (currently amended) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing bath for processing semiconductor wafers, said method comprising:

processing said semiconductor wafers in a semiconductor processing bath having a processing bath volume contained in a vessel:

reducing said processing bath volume of said semiconductor processing bath in a processing vessel by rapidly removing an upper portion of a said semiconductor processing ~~fluid bath~~ present in said ~~processing~~ vessel, while said wafers are immersed in a remaining lower portion of said semiconductor processing ~~fluid in said~~ bath, to permit flow of said upper portion of said processing ~~fluid bath~~ out of said vessel and thereby break surface tension forces holding said surface contaminants at said air/liquid interface, an overall volume of ~~fluid~~ liquid remaining in said ~~processing~~ vessel being less than said processing bath volume; and

removing said semiconductor wafers from said ~~remaining~~ lower portion of said semiconductor processing ~~fluid~~ bath remaining in said vessel.

69. (previously presented) The method for removing surface contaminants according to claim 68, wherein said upper portion of said semiconductor processing fluid is removed by a paddle from a top of said bath.

70. (previously presented) The method for removing surface contaminants according to claim 68, wherein said upper portion of said semiconductor processing fluid is removed by opening a valve in said processing vessel.

71. (previously presented) The method for removing surface contaminants according to claim 68, wherein said upper portion of said semiconductor processing fluid is removed by hingedly releasing a door located at an upper portion of said processing vessel.

72. (previously presented) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing bath for processing semiconductor wafers, said method comprising:

rapidly removing an upper portion of a semiconductor processing fluid present in said bath by sliding a door located at an upper portion of said bath, while said wafers are in said bath, to permit flow of said upper portion of said processing fluid and thereby break surface tension forces holding said surface contaminants at said air/liquid interface.

73. (previously presented) A method for removing surface contaminants from an air/liquid interface of a semiconductor processing bath for processing semiconductor wafers, said method comprising:

processing said semiconductor wafers in a semiconductor etching solution; and
rapidly removing an upper portion of said semiconductor etching solution by rapidly removing a wafer boat containing said wafers from said bath, to permit flow of said upper portion of said processing fluid and thereby break surface tension forces holding said surface contaminants at said air/liquid interface.

74. (previously presented) The method for removing surface contaminants according to claim 68, wherein said upper portion of said semiconductor processing fluid is removed by telescopically collapsing sidewalls of said processing vessel containing said bath.

75. (previously presented) A method for reducing the contamination on a semiconductor wafer from a wet etching bath comprising:

processing said semiconductor wafer in said wet etching bath containing an etching fluid;

subsequently reducing a volume of etching fluid in said wet etching bath and breaking eddy currents of said wet etching bath by rapidly removing an upper portion of said etching fluid from a processing vessel containing said wet etching bath to reduce an overall volume of fluid contained within said processing vessel, said act of breaking said eddy currents further releasing surface contaminants which are formed at an air/liquid interface of said wet etching bath and held at said air/liquid interface by said eddy currents; and

subsequently removing said semiconductor wafer from said reduced overall volume of fluid.

76. (previously presented) A method for reducing the contamination on a semiconductor wafer from a wet etching bath comprising:

processing said semiconductor wafer in said wet etching bath containing an etching fluid completely filling a processing vessel;

subsequently reducing a volume of said etching fluid and breaking surface tension forces of said wet etching bath by rapidly removing an upper portion of said etching fluid from said processing vessel containing said wet etching bath and reduce an overall volume of fluid contained within said processing vessel such that said processing vessel is no longer full, said act of breaking said surface tension forces further releasing surface contaminants which are formed at an air/liquid interface of said wet etching bath and held at said air/liquid interface by said eddy currents; and

subsequently removing said semiconductor wafer from said wet etching bath having a reduced overall volume of fluid.

77. (previously presented) A method for reducing the contamination on a semiconductor wafer, said method comprising:

processing said semiconductor wafer immersed in a static etching bath containing an etching fluid; and

reducing a volume of said etching fluid by rapidly removing an upper portion of said etching fluid from a container holding said static etching bath to reduce an overall volume of fluid contained within said container, such that said container holds less fluid while said semiconductor wafer is immersed in a remaining portion of said static etching bath.